A Contract for Constructing a Building in Steel
ELEVATION OF ROOF SECONDARY TRUSSES ALONG GRID LINE F1 / K1
## Materials to be approved

<table>
<thead>
<tr>
<th>Materials</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joists, Beams, Tees, Tees</td>
<td>To BS 4: Part 1</td>
</tr>
<tr>
<td>Columns, Channels</td>
<td></td>
</tr>
<tr>
<td>Hollow Sections</td>
<td>To BS 4848: Part 2</td>
</tr>
<tr>
<td></td>
<td>Replaced by BSEN 10210</td>
</tr>
<tr>
<td>Angles</td>
<td>To BS 4848: Part 4</td>
</tr>
<tr>
<td></td>
<td>Replaced by BSEN 10056-1</td>
</tr>
<tr>
<td>Cold Formed Sections</td>
<td>To BS 2994</td>
</tr>
</tbody>
</table>
Proof of Quality

- Manufacturer’s Certificates
- Steel manufactured to BS 4360 (replaced by BSEN 10029, 10113, 10115, 10210)
- Ultimate strength
- Yield stress
- % of Elongation
Weldability

Given in terms of Carbon Equivalent Value, by per cent:

\[
\text{CE} = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}
\]

Normally no welding problem if CE is less than 0.35%
**British Steel - Tubes & Pipes**

**Customer**
BSS STEEL SERVICE CENTRE
GRANTHAM
SPITFLEET INDUSTRIAL ESTATE
GRANTHAM
LINCOLNSHIRE
NG31 7UP

**INSTRUCTION CERTIFICATE**

**British Steel Ref. No.**
BSA 741096

**Sales**
Works 3486

**Customer Order No.**
P/O: 56708

**OF 21/FEB/97**

**Product Description**

HOT FINISHED WELDED STEEL RECTANGULAR HOLLOW SECTIONS TO EN 10210 – 1994 GRADE S275JR.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Number of Pieces</th>
<th>Product Dimensions</th>
<th>Cast/Heat No.</th>
<th>Toughness Test</th>
<th>Impact/Hardness Tests</th>
<th>Steel Making Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10</td>
<td>200.00 x 100.00 x 8.00</td>
<td>5828381</td>
<td>338.0 475.0 35</td>
<td>B L S</td>
<td>C70</td>
</tr>
</tbody>
</table>

**Analysis**

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.16</td>
</tr>
<tr>
<td>Si</td>
<td>0.180</td>
</tr>
<tr>
<td>Mn</td>
<td>0.0100</td>
</tr>
<tr>
<td>P</td>
<td>0.0040</td>
</tr>
<tr>
<td>S</td>
<td>0.0600</td>
</tr>
<tr>
<td>Cr</td>
<td>0.0340</td>
</tr>
<tr>
<td>Mo</td>
<td>0.0001</td>
</tr>
<tr>
<td>Ni</td>
<td>0.0001</td>
</tr>
<tr>
<td>Al</td>
<td>0.0034</td>
</tr>
<tr>
<td>Cu</td>
<td>0.0003</td>
</tr>
<tr>
<td>N</td>
<td>0.0033</td>
</tr>
<tr>
<td>Nb</td>
<td>0.0033</td>
</tr>
<tr>
<td>Sn</td>
<td>0.0003</td>
</tr>
<tr>
<td>Ti</td>
<td>0.0033</td>
</tr>
<tr>
<td>V</td>
<td>0.31</td>
</tr>
<tr>
<td>CEV</td>
<td></td>
</tr>
</tbody>
</table>

**Cert No.**
120/9715/0217

**Date**
08/04/97

**For Technical Manager**

This document has been prepared by a computer system and is valid without signature.
Purchaser’s Tests

- To be performed at HOKLAS accredited laboratories
- One specimen for every 40 tonnes or part thereof of each section of the same thickness from the same cast
- Same thickness means similar sections with a variation in thickness not exceeding +5 mm
Tensile strength test to BS 18
(Replaced by BSEN 10002-1)

- Ultimate strength
- Yield Stress
- % of Elongation

Chemical composition can also be checked by spectrum analysis, but seldom done
# Mechanical Properties of Structural Steel

<table>
<thead>
<tr>
<th>Grade of Steel</th>
<th>Ultimate Tensile Stress</th>
<th>Yield Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Up to and including 16 mm</td>
</tr>
<tr>
<td>43</td>
<td>430 – 580 MPa</td>
<td>275 MPa</td>
</tr>
<tr>
<td>50</td>
<td>490 – 640 MPa</td>
<td>355 MPa</td>
</tr>
<tr>
<td>55</td>
<td>550 – 700 MPa</td>
<td>450 MPa</td>
</tr>
</tbody>
</table>
## Connections – Rivets and Bolts

- Rivetting is seldom done nowadays
- Manufacturer’s certificates are required

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Bolts</td>
<td>Grade 4.6</td>
<td>BS 4910:2001</td>
</tr>
<tr>
<td></td>
<td>Grade 8.8</td>
<td>BS 3692:2001</td>
</tr>
<tr>
<td>High Strength</td>
<td>General Grade</td>
<td>BS 4395: Part 1</td>
</tr>
<tr>
<td>Friction Grip</td>
<td></td>
<td>ISO standard identical</td>
</tr>
<tr>
<td>Bolts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSFGB</td>
<td>Higher Grade</td>
<td>BS 4395: Part 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO standard identical</td>
</tr>
</tbody>
</table>
BOLT  NUT  BOLT  NUT
GRADE 4.6  GRADE 8.8  GENERAL GRADE  HIGHER GRADE

BLACK BOLTS  HIGH STRENGTH FRICTION GRIP BOLTS
HSFBs achieve their shear strength by friction

Tightening has to be strictly in accordance with the manufacturer’s instructions:

i) By specified torque using manual or pneumatic wrench

ii) By measuring the gap between the nut and the steel surface to be connected

iii) By shearing off the section of reduced area
Welding Procedures to BS

- Preparation of fusion faces
- Preheating temperature of 120°C for thick sections
- Type of electrodes
- Number and sequence of runs to build up the weld bead
- Post heating treatment if required
Stanger Asia

WELDER APPROVAL TEST CERTIFICATE (BS 4871 : PART 1 : 1982)

Date Welded: 01/12/97
Certificate No.: WEL7004
Test Date: 08/12/97

Manufacturer's Name: Far East Structural Steel Work Engineering Ltd.
Project: TM82/93
Welder's Identity: Name: Taj Ud Din
I.D. No.: A977803(A)

Test Piece Details
Welding process: MMA (AC)
Parent Material(s): Carbon Steel Plate
Thickness: 16mm
Joint Type: Single Vee Butt Weld
Pipe Outside diameter: N/A
Welding position(s): Vertical Up
Test piece position: Fixed, Axis Vertical

Extent of Approval
Welding position(s): MMA (AC)
Materials range: Carbon Steel Plate
Thickness: 8mm to 32mm
Joint Type: Same as stated type
Pipe O.D. range: N/A
Welding position(s): Vertical Up & Flat
Consumables: Basic & Rutil
Remark: Covered electrode

Welding Consumables
Filler material: Kobe Steel Co., Ltd. LB52
Composition: See manufacturer's specification
Specification: AWS E7016
Size(s): ø3.2mm & ø4.0mm
Shielding gas/gas: N/A
Make and type: N/A
Composition specification: N/A

TEST RESULTS

Non-Destructive test
Visual Examination: Acceptable
Magnetic Particle or Penetrant: Acceptable
Radiography: N/A
Ultrasonecs: Acceptable

Destructive test
Macro-examination: N/A
Bend: N/A
Test 1-Acceptable: Test 1-Acceptable
Test 2-Acceptable: N/A
Side Bend: Test 2-Acceptable
Fillet Weld Fracture: N/A

Remarks: Passed
Expiring Date of Certificate: 07/06/98

The statements in this certificate are correct. The test weld was prepared, welded and tested in accordance with the requirements of BS 4871: Part 1: 1982.

Welding witnessed by: Aaron S.K. Li
Certified by: [Signature]

Stanger Asia Limited

WELOTA; Issue 96 No. 1
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GIF and 1st, One Wel Industrial Building, 23 On Chuen Street, Tuen Mun, New Territories, HONG KONG. Tel: 2339-0692 / 2326-2966
### Project No. 000001

**Date:** August 22, 1993

**Record of approval test of welding procedure**

**Procedure No.:** PEI-97-02

**Welding procedure:** Single Root Test, 70% of HRC

**Welding position(s):** Horizontal

**Weld preparation:** (a) Bevelled (b) Root face square

**Method of preparation and cleaning:** Sandblasting & Squeezing

**Welding consumables:**
- **Filler material:** E308L (AWS E308L-16)
- **Alternate:** E316L, E309L
- **Composition:** C=0.06, Mn=0.75, Si=0.3
- **Proxy:** E6011, E6017

**Welding conditions:**
- **Welding current:** 120 A
- **Voltage:** 21-25 V
- **Gas type:** A/C, A/C, A/C
- **Rated speed:** 150 rpm
- **Welding speed:** 15-20 mm/min

**Test results:**
- **Temperature:**
  - **Preheat:** NA
  - **Intergas:** NA
  - **Post-weld heat treatment:** NA

**Weld examination:**
- **Method:** Radiography
- **Inspection:** Visual

**Other information:**
- **Inspector:** W. F. Chan
- **Examiner:** NA

**Remarks:** (If any)
Heating pad
Non-destructive testing of welds

- Visual Inspection
- Magnetic Particle Tests
- Ultrasonic Tests
- Radiography
CRT display with no defect present

Entry → Defect echo

CRT

Weld

Signals reflected from lack of side-wall fusion
Fig. 9.12 Reflection technique using a normal probe which injects pulses of ultrasonic vibrations at right angles to the plate surface
Fewer rays absorbed hence greater intensity over this area

Principles of radiography
Orientation of defect with respect to X-rays

Defects at right angles to rays not detected

Defects at an angle to the rays give diffuse image.

Cracks in line with the rays give sharp image.
RT
X ray
30kV to 500kV
Penetration depth for steel up to 50 mm
Known Defects
Tubular Test Piece
**Transverse Crack:** A fracture in the weld metal running across the weld.

**Cluster Porosity:** Rounded or slightly elongated voids grouped together.

**X Ray films**

**Transverse cracks**

**Cluster porosity**
Common Defects in Welds

- Undercutting
- Lack of Penetration
- Lack of Fusion
- Porosity
- Slag inclusion
- Cracking
FIG 8. ROOT CONCAVITY

FIG 9. UNDERCUTTING
FIG. G  INCOMPLETE PENETRATION

FIG. 7  LACK OF SIDE FUSION
RADIOGRAPHIC INSPECTION REPORT

Report No. : WEL0611/3479  Date of Report : 11.11.96

Client : Far East Structural Steel Work Engineering Ltd.
Project : Yuen Long Civic Centre Auditorium Platform Beam
Job Description : Yuen Long Civic Centre

Contract No. : N.A.  Our Job No. : 195.16
Works Order No. : N.A.  Serial No. : N.A.
Maint. W.O. No. : N.A.

MATERIAL/JOINT DETAILS
Material : N.A.  Preparation : Single Vee Butt Weld
Surface condition : N.A.  Welding process : MMA

STANDARD
Acceptance Code : BS5153 Table18 Category A

METHOD
Radiation source : Iridium 192
Source dimension : 2mm X 3mm
Strength/Tube voltage : 40 cv.
Film Type : Agfa D7ph vacucap
Intensifying screen : Pb-0.03 mm front/0.03 mm back
Density range : 2-3
Exposure : Various
FDF/SFD : 400 mm
Material thickness : 20mm
Penetrattimeter (IQD) : BS-3971
Sensitivity : 1.8%
Processing : Manual Processing - 5 min. at 20°C

TEST RESULTS
No. of radiographic films : 16

Please refer to attached sheet for result interpretation

Tested By : W.T. Fuung  Date of inspection : Certified by:
K.C. Chu  29 & 31 Oct 96

WEL02 Issue 95 No. 1

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### RADIOGRAPHIC INSPECTION REPORT

**Report No.:** WEL9611/3479  
**Date of Report:** 11.11.96

<table>
<thead>
<tr>
<th>Beam No.</th>
<th>Radiographic film no.</th>
<th>Interpretation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>2SG1 - T</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG1 - B</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG1 - W1</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG1 - W2</td>
<td>Y-Z</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG2 - T</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG2 - B</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG2 - W1</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG2 - W2</td>
<td>Y-Z</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG3 - T</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG3 - B</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG3 - W1</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG3 - W2</td>
<td>Y-Z</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG4 - T</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG4 - B</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG4 - W1</td>
<td>X-Y</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2SG4 - W2</td>
<td>Y-Z</td>
<td>No Significant Defect</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

WEL02 Issue 95 No. 1

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Acceptance Standard

- PNAP 160
- National Structural Steelwork Specification – 2nd Edition
- British Constructional Steelwork Association
**Table 2: Weld Quality Acceptance Criteria & Corrective Actions**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>WELD TYPE</th>
<th>PARTICULAR CONDITIONS</th>
<th>ACCEPTANCE REQUIREMENTS (All dimensions in mm)</th>
<th>REMEDIAL ACTION FOR NON-COMPLIANT WELDS (NOTE 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>ALL</td>
<td></td>
<td>As specified on drawings</td>
<td>Repair</td>
</tr>
<tr>
<td>Weld Type</td>
<td>ALL</td>
<td></td>
<td>As specified on drawings</td>
<td>Refer to Engineer</td>
</tr>
<tr>
<td>Length</td>
<td>ALL</td>
<td>&lt; As specified on drawings</td>
<td>Repair</td>
<td></td>
</tr>
<tr>
<td>Throat Thickness</td>
<td>Butt</td>
<td>t &lt; As drawing (Av. 70)</td>
<td>h.c.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Filler</td>
<td>t &lt; As drawing (Av. 70)</td>
<td>a repair or grind &amp; MPI after grinding</td>
<td></td>
</tr>
<tr>
<td>Leg Length</td>
<td>Filler</td>
<td>t ≥ As drawing</td>
<td>a repair</td>
<td></td>
</tr>
<tr>
<td>Toe Angle</td>
<td>ALL</td>
<td>0 ≤ 90°</td>
<td>a grind &amp; MPI after grinding</td>
<td></td>
</tr>
<tr>
<td>Caps/Root Bead (Height or convexity)</td>
<td>Butt</td>
<td>Butt Joint</td>
<td>-1 &gt; C, &gt; 4 a</td>
<td>Repair or grind</td>
</tr>
<tr>
<td></td>
<td>Butt</td>
<td>Butt Joint</td>
<td>m &gt; As drawing + 0.25t</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALL</td>
<td>Cruciform Joint</td>
<td>m &gt; As drawing + 0.55t and &gt; As drawing + 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALL</td>
<td>Undercut</td>
<td>Longitudinal Weld U, + U, &gt; 0.1t (Av. 100)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse Weld</td>
<td>U, + U, &gt; 0.1t (Av. 100) and &gt; 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Root Penetration (Lack of)</td>
<td>Repair and double scope of Ultrasonic inspection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SINGLE Sided Butt</td>
<td>Longitudinal Weld</td>
<td>t &gt; As drawing + 0.1t (Av. 100) and &gt; As drawing + 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Butt</td>
<td>Transverse Weld</td>
<td>t &gt; As drawing + 0.1t (Av. 100) and &gt; As drawing + 3</td>
<td></td>
</tr>
<tr>
<td>Porosity</td>
<td>ALL</td>
<td>Longitudinal Weld</td>
<td>Ed ≥ 20 in 100 (length)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse Weld</td>
<td>Ed ≥ 10 in 100 (length)</td>
<td></td>
</tr>
<tr>
<td>Lack of Fusion Cracks</td>
<td>ALL</td>
<td>NOT PERMITTED</td>
<td>Repair and Increase MPI to 100% (Note 1)</td>
<td></td>
</tr>
<tr>
<td>Slag Inlets &amp; Lack of Fusion/Root Penetration</td>
<td>ALL</td>
<td>ALL Welds</td>
<td>h ≥ 3 As drawing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Longitudinal Weld</td>
<td>E ≥ 6 in 200 (length)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transverse Weld</td>
<td>E ≥ 3 in 200 (length)</td>
<td></td>
</tr>
<tr>
<td>Root Gap</td>
<td>Filler or Partial Pen</td>
<td>Ten, Cruciform, Corner &amp; Lap Joint</td>
<td>r ≥ 2 (Av 100) and r ≥ 3</td>
<td></td>
</tr>
<tr>
<td>Cracks</td>
<td>ALL</td>
<td>NOT PERMITTED</td>
<td>Repair &amp; Double scope of US inspection</td>
<td></td>
</tr>
<tr>
<td>Lamellar Tears</td>
<td>ALL</td>
<td>Ten, Cruciform, Corner &amp; Lap Joint</td>
<td>NOT PERMITTED (Note 3)</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Where there are two limits for one dimension both shall apply. All limits are peak values unless indicated as average.
2. Where a repair is necessary an approved procedure must be used. If increasing the scope of inspection, further non-conformances are found, the scope shall be increased to 100% for the joint type in question.
3. May be accepted up to the limits for slag inlets if the joint is subjected to longitudinal shear only.
4. All welds to the same procedure.
5. Abbreviations:
   - Av. 100 or Av. 50 indicates the average value over 100 mm or 50 mm length
   - < Not less than
   - ≥ Not greater than
   - Σ Sum of

**Dimensional Symbols**

**Definition of Measurements**

**Figure:** View on surface of weld. Typical Discontinuities. Typical section through sub-surface defects.
<table>
<thead>
<tr>
<th>Surface Discontinuities</th>
<th>ALL</th>
<th>Longitudinal Weld</th>
<th>Transverse Weld</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Undercut</strong></td>
<td>ALL</td>
<td>$U_1 + U_2 \geq 0.1t$ (Av. 100) and $\geq 2$</td>
<td>$U_1 + U_2 \geq 0.05t$ (Av. 100) and $\geq 1$</td>
<td>d,e</td>
</tr>
<tr>
<td><strong>Root Penetration</strong></td>
<td>Single Sided Butt</td>
<td>Longitudinal Weld</td>
<td>$r_p \geq$ As drawing + 0.1t (Av. 100) and $\geq$ As drawing + 3</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
<td>Transverse Weld</td>
<td>$r_p \geq$ As drawing + 0.05t (Av. 100) and $\geq$ As drawing + 2</td>
<td>c</td>
</tr>
<tr>
<td><strong>Porosity</strong></td>
<td>ALL</td>
<td>ALL Welds</td>
<td>$\Sigma d \geq 20$ in 100 (length)</td>
<td>f</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
<td>Longitudinal Weld</td>
<td>$\Sigma d \geq 10$ in 100 (length)</td>
<td>f</td>
</tr>
<tr>
<td><strong>Lack of Fusion &amp; Cracks</strong></td>
<td>ALL</td>
<td>NOT PERMITTED</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Repair and double scope of Ultrasonic inspection if root is inaccessible
Repair of Welds

- Back – gouging with carbon rod
- More damage is done when trying to rectify defects
Surface Protection

BS EN ISO 12944 and 14713

- Determined by exposure conditions and service life before first maintenance

- Permanent surface protection includes:
  - Zinc Rich Paint to BS 4652
  - Hot-dip galvanizing – to BS EN ISO 1461:1999, to achieve a film thickness of 85 µm
Painting Systems

Paint is very much like concrete but consists of inert powder and binder.

Binder can be one-pack drying oil or two-pack epoxy.
Drying oils cure or harden in the presence of atmospheric oxygen

- Linseed oil
- Urethane
- Alkyd
- Modified alkyd
- Phenolic

- Two-pack epoxy hardens by chemical action
A painting system consists of 3 coats

- Primer – mobile enough to adhere to the surface
- Undercoat – actual protective barrier
- Finishing Coat – additional protection and final appearance

- Compatibility – incompatible paints will lead to saponification
## Example of a painting system

| Surface Preparation | Primer | 2-pack epoxy based zinc rich primer to BS 4652  
| Sa 2.5 | dry film thickness = 75 μm |
| Undercoat | 2-pack epoxy based micaceous iron oxide paint  
| | dry film thickness = 100 μm |
| Finishing Coat | 2-pack recoatable polyurethane finishing paint, applied in 2 coats  
| | dry film thickness =100 μm |
| Minimum dry film thickness | 275 μm |
Hot Dip Galvanizing

- Degreasing with caustic soda
- Pickling with hydrochloric acid
- Rinsing
- Fluxing with zinc aluminium chloride solution
- Drying & pre-heating
- Hot dip galvanizing
- Water quenching
# Painting over galvanized steel

<table>
<thead>
<tr>
<th>Surface Preparation</th>
<th>Primer</th>
<th>Nil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot dip galvanized</td>
<td>Pretreatment</td>
<td>Apply etching solution, e.g. British Rail T-wash, Icosit 5530 or equivalent</td>
</tr>
<tr>
<td></td>
<td>Undercoat</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td>Finishing Coat</td>
<td>Finishing paint other than drying oil type, recommended as suitable by paint manufacturer for direct application to etched zinc surface 35 μm</td>
</tr>
<tr>
<td></td>
<td>Minimum dry film thickness</td>
<td>35μm</td>
</tr>
</tbody>
</table>
Erection Procedure

- To prevent collapse during erection
- To ensure alignment
- To avoid overstressing

- A method statement from the contractor is a must
**Common Cases of Instability**

Figure 1.

- Tendency to topple

Fig. 1a

- Temporary weld attachments

Fig. 1d

- ROLLER SUPPORT

Fig. 1b

- Trusses tipping in one direction

Fig. 1e

- Normal support

Fig. 1c

- Bracings not installed

Fig. 1c
Figure 3

Figure 2: Lifting of beams
do not rely on purlins for stability

permanent end bracing

temporary intermediate bracing

sequence of erection

ERECTION OF ROOF TRUSSES

FIGURE 2
ERECTION OF MULTI-STOREY FRAMES

FIGURE 6 - (only lowest storey shown.)

1st panel to be erected and stabilized by bracing

other panels to be erected progressively outwards

temporary bracing
Sequence of Erection

1. Columns - with temporary bracing
2. Eaves members
3. Trusses
4. Horizontal bracings
5. Purlins
6. Repeat steps 1 to 5 for subsequent bays

(a) Perspective view

(b) Plan

Fig. 5 Erection of Shed-type building
(Adopted from Jutzi & Wellman Ref. 4)
purlins & sidetrays cannot be relied on to provide stability.

First two portal frames to be erected.

Sequence of erection:

Eaves beam

Ridge beam

Side bracing essential

Roof bracing optional

Erection of portal frames

Figure 4

First bay secured to concrete building
Thank You